What is claimed is:

1. A method of operating an internal combustion engine, more specifically a diesel combustion engine with homogeneous fuel combustion, characterized in that a condition variable in the cylinder, preferably the pressure, the temperature, the ion flow or the output signal of an optical principle of measurement as a function of the crank angle is determined and a signal about the cylinder condition is obtained therefrom, wherein at least two characteristic cycle values from the group comprising mass fraction of the injected fuel burned, maximum pressure increase in the cylinder, combustion noise, start of combustion or duration of combustion are determined from the cylinder condition signal, the determined characteristic cycle values are compared with desired values for the characteristic cycle values entered in a characteristic diagram and a given difference between the two values is computed and the difference is supplied to a regulation algorithm and the time of fuel ignition of at least one injection event and/or the inert gas fraction in the cylinder are adjusted as a correcting variable in order to stabilize combustion and/or to minimize noise and exhaust emission.

2. The method of operating an internal combustion engine, more specifically in accordance with claim 1, characterized in that the characteristic cycle values are determined either from the output signal of a sensor making use of an acoustic, optical, electrical, thermodynamic or mechanical principle of measurement, through a mathematical model or by combining the sensor-based and the model-based approach.

3. The method of operating an internal combustion engine, more specifically in accordance with claim 1 or 2, characterized in that the 50% mass fraction of the injected fuel burned and the maximum in-cylinder pressure increase are determined as the characteristic cycle values.

4. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 1 through 3, characterized in that supply and variation of the inert gas mass within the cylinder are carried out through

external exhaust gas recirculation or through in-cylinder exhaust gas recirculation or by combining internal and external exhaust gas recirculation.

5. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 1 through 4, characterized in that the control variables fuel injection timing of at least one injection event and inert gas fraction within the cylinder are adjusted simultaneously by means of the regulation algorithm.

6. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 1 through 5, characterized in that a precontrol value that is dependent on the operating condition of the engine and has been entered in a respective characteristic diagram is added to a respective one of the values calculated for the control variables through the regulation algorithm.

7. A method of operating an internal combustion engine, more specifically a diesel combustion engine which is switched at least between a first and a second mode of operation as a function of at least one characteristic engine operation parameter, involving the following steps:

   - selecting at least one, preferably at least two, characteristic engine operation parameters,

   - associating value ranges with each engine operation parameter, at least one first value range being associated with the first mode of operation and at least one second value range being associated with the second mode of operation,

   - comparing the actual values of the selected characteristic engine operation parameters with the value ranges,

   - switching to the second mode of operation or remaining in the second mode of operation when all the selected characteristic engine operation parameters lie within the second value ranges.

8. The method of operating an internal combustion engine, more specifically in accordance with claim 7, characterized in that the engine is switched to the first mode of operation or remains in the first mode of operation when at least one actual value of a selected characteristic engine operation parameter lies within the first value range.

9. The method of operating an internal combustion engine, more specifically in accordance with claim 7 or 8, characterized in that at least one threshold value for switching between the modes of operation is associated with each selected characteristic engine operation parameter, the first and the second range of values being separated by said threshold value.

10. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 7 through 9, characterized in that at least one, preferably two, characteristic engine operation parameters are selected from the group comprising engine speed, engine load, engine coolant temperature, atmospheric pressure, temperature of the exhaust gas after-treatment system, exhaust gas temperature upstream of the exhaust gas after-treatment system, exhaust gas temperature downstream of the exhaust gas after-treatment system, speed of the engine speed change, speed of the engine load change and actual transmission ratio of the driving train.

11. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 7 through 10, characterized in that the internal combustion engine is operated in the first mode of operation with conventional diesel combustion and in the second mode of operation with alternative diesel combustion.

12. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 7 through 11, characterized in that a predetermined fixed value is selected for at least one threshold value.

13. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 7 through 12, characterized in that at least one threshold value of at least one selected characteristic engine operation parameter is determined as a function of at least one other engine operation parameter.

14. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 7 through 13, characterized in that at least one threshold value has a hysteresis.

15. A method of operating an internal combustion engine, more specifically a diesel combustion engine which is switched at least between a first and a second mode of operation as a function of at least one characteristic engine operation parameter, characterized in that switching occurs as a function of the measured and/or calculated temperature before and/or after the exhaust after-treatment system.

16. A method of operating an internal combustion engine, more specifically a compression ignition internal combustion engine, involving the following steps:

- determining a desired value for injection timing and/or a combustion situation,

- determining a desired value for the ratio fresh air mass to inert gas mass inside the cylinder and/or for the air/fuel ratio in the exhaust,

- measuring or computing an actual value for the ratio fresh air mass to inert gas mass inside the cylinder and/or for the air/fuel ratio in the exhaust,

- calculating the difference between the desired value and the actual value of the ratio fresh air mass to inert gas mass inside the cylinder or of the air/fuel ratio in the exhaust,

- correcting the desired value of injection timing or the combustion situation as a result of the difference between the desired value and the actual value of the

ratio fresh air mass to inert gas mass in the cylinder or of the air/fuel ratio in the exhaust.

17. The method of operating an internal combustion engine, more specifically in accordance with claim 16, characterized in that the desired value for injection timing and/or for the combustion situation is corrected by being advanced if the actual value for the ratio fresh air mass to inert gas mass inside the cylinder and/or the air/fuel ratio in the exhaust is smaller than the desired value for the ratio fresh air mass to inert gas mass or the air/fuel ratio in the exhaust.

18. The method of operating an internal combustion engine, more specifically in accordance with claim 16 or 17, characterized in that the desired value for injection timing and/or for the combustion situation is corrected by being retarded if the actual value for the ratio fresh air mass to inert gas mass inside the cylinder and/or the air/fuel ratio in the exhaust is greater than the desired value for the ratio fresh air mass to inert gas mass or the air/fuel ratio in the exhaust.

19. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 16 through 18, characterized in that the desired value for injection timing is determined by simple control – without feedback on the actual combustion situation.

20. The method of operating an internal combustion engine, more specifically in accordance with any one of the claims 16 through 19, characterized in that injection timing is determined by regulation from the difference between the desired value of the combustion situation and the actual value of the combustion situation – using a combustion regulator with feedback on the actual combustion situation.